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October 3, 1973

Ladies and Gentlemen:

This draft environmental impact statement is submitted pursuant to the Montana Environmental Policy Act, Section 69-6504(b)(3). The statement was prepared by the Staff Services Division of the Montana Department of State Lands and regards the practice of spraying sagebrush on state school trust lands with 2,4-D.

There are no firm commitments by the Department of State Lands to treat specific ranges for sage control. There are several projects in the planning stage but the decision to proceed with these projects has not been made. This environmental impact statement then is not to treat each of these projects on a site-specific basis at this time but to serve as a forum for public discussion of the advisability one aspect of the management of state trust lands.

Under the Montana Environmental Policy Act, all interested parties have thirty (30) days to comment following publication of a draft environmental impact statement. A fifteen (15) day extension of the comment period will be given upon written request.

Comments should be submitted to the Environmental Coordinator, Staff Services Division, Montana Department of State Lands, Capitol Station, Helena, Montana, by November 2, 1973.

Sincerely,

Sharon M. Solomon

SHARON M. SOLOMON
Environmental Coordinator
Staff Services Division

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ENVIRONMENTAL IMPACT STATEMENT

ADMINISTRATIVE ACTION - Spraying of sagebrush with 2,4-D on State School Trust Lands

Pursuant to the Montana Environmental Policy Act
Section 69-6504 (b) (3), R.C.M. 1947

Prepared by

STAFF SERVICES DIVISION
MONTANA DEPARTMENT OF
STATE LANDS

HELENA, MONTANA
October 3, 1973

DESCRIPTION OF ACTION

The action being proposed is control of big sagebrush (Artemesia tridentata) on State of Montana School Trust Lands by the aerial application of 2,4-dichlorophenoxy acetic acid. The normal amount to be applied to sagebrush ranges is 2 pounds of the acid equivalent of a 2,4-D ester. The usual ester is n-butyl.

The action could occur when a lessee of state land requests permission to control big sage at his own expense or when the Department of State Lands participates in a control program with a lessee.

The primary objective of control of big sagebrush is to reduce the competition between big sagebrush and livestock forage species and therefore to insure optimum livestock forage production on rangelands.

The statement is concerned with the practice itself, not with any specific control project.

ENVIRONMENTAL IMPACT

Vegetation:

The primary effect and objective of the action is to produce an environmental impact on rangeland vegetation. The primary impact is removal of big sage.

There is evidence that some of the heavy sagebrush concentration on rangeland has resulted from previous environmental changes produced by man.[1] Studies have shown that grasses established concurrently with sagebrush seedlings have an initial advantage and suppress sagebrush seedlings.[2] When the vigor of grass plants is seriously reduced by continuous grazing, sagebrush seedlings then have a competitive advantage.

Ranges with over 25% cover of sagebrush are considered for sagebrush control on state lands. It cannot be precisely determined, however, whether these ranges were disturbed by extensive livestock usage or whether the density is the result of natural factors. If these ranges were disturbed by man through his livestock then sagebrush control represents an effort by man to again disturb the ecological system to restore a competitive advantage to grass species.

A few researchers believe that an amount of sagebrush cover over 10%, relative to other vegetation, represents a disturbed ecological system on some specific sites.[3] There may be sites, however, which have a climax percentage of sagebrush over 25%. On these sites the action becomes one of simply increasing grazing capacity.

The economic benefits from the vegetation changes resulting from sagebrush control come from a 50 to 400 percent increase in livestock forage.[4] The U.S. Forest Service has determined that an average grass production increase of 740 pounds per acre has resulted from control programs in the Beaverhead National Forest.[5]

Sagebrush control programs can also cause an adverse impact on forbs and other non-target plants. (See Part III).

Soil:

The effect of chemical sagebrush control on soil moisture is not fully understood and conflicting results have been obtained from research. Changes occur in the moisture withdrawal by sagebrush, snow retention, total evapo-transpiration, and runoff. Some studies show an increase in soil moisture due to these variables and others show no change or a decrease.[4,6,7] There have been some reported occurrences of increased water flow and the appearance of new springs in drainages treated by 2,4-D for sagebrush control.[8] It cannot be stated that this would occur on every drainage, however.

Contamination of the soil by 2,4-D applied at the normal rate is not considered to be a significant impact. The persistence of the chemical has been reported to range from 2 to 14 weeks. 2,4-D is readily decomposed by soil organisms and is considered to have no adverse effects on the total number of microorganisms in the soil. Little is known about the effects on higher soil organisms but research has shown that 2,4-D applied at normal agricultural rates has no effect on the number of wire-worms, springtails, mites or earthworms.[9]

Control of sagebrush on steep slopes, where some bare ground occurs, and in small, narrow, steep drainages where sagebrush serves as a natural retardant to soil erosion would be expected to cause increased soil erosion. These sites are not considered for sagebrush control. Current research concludes that there is no evidence that chemical control either increases or decreases soil erosion as a general rule. Slope, soil type and vegetation type apparently have more influence on erosion than does herbicide treatment.[6]

Wildlife:

From present knowledge no significant impact on wildlife is expected from the direct toxic action of 2,4-D. Acute oral toxicity levels for 2,4-D are higher than the amounts that wildlife are likely to ingest.[5,10,11] 2,4-D is classified as a noncarcinogenic compound.[9] Teratogenic effects (birth defects) of 2,4-D, however, are not clearly understood. There is some evidence that 2,4-D administered in laboratory tests at levels as low as 48 mg./kg. resulted in a significant increase in abnormal fetuses.[12] The test results are not conclusive and cannot be directly related to the effects of 2,4-D application on rangeland. However, a report issued by the U.S. Department of Health, Education and Welfare has recommended that the butyl, isopropyl and isoctyl esters of 2,4-D undergo further tests because of their possible teratogenic effect.[9]

2,4-D, because of its low persistence, has not been shown to accumulate in food chains.

Control of sagebrush will have a significant impact on the use of land for wildlife habitat. Repeated applications of 2,4-D have been used to reduce populations of pocket gophers by eliminating vegetation which the gophers depend upon for food.[13] Numerous other wildlife species depend upon sagebrush for food and cover (See Part III). Increased grass production will, however, provide some cover and greater habitat for grazing species but it cannot be assumed that this benefit overrides possible adverse effects.

Fish:

Although department policy usually limits spraying within 300 feet of streams and other water bodies, 2,4-D may enter aquatic environments through spray drift, pilot error, or runoff if rain occurs immediately after spraying. Spray drift is minimized by not spraying during windy conditions and by leaving a buffer zone around streams and ponds. Spraying would not be conducted by the state if rain is likely to occur immediately after the spray.

It cannot be stated that 2,4-D which does enter streams has no effect on fish and other aquatic organisms. The amount, degree and ultimate long range impact would depend upon many site-specific factors, other spray projects being conducted in the same drainage, species specific reactions to 2,4-D, and the effects on organisms due to changes in the ecological balance of the stream or lake.

LD_{50} (Dosage producing 50% mortality during a specified exposure period) levels and other tolerance concentrations for aquatic organisms are difficult to relate to actual conditions which will occur in a specific stream or pond. Even concentrations below LD_{50} levels cannot be assumed to be acceptable because a 50% mortality in fish is not acceptable, and the relation between a LD_{50} and LD_5 or LD_1 level is not fixed and varies with both the chemical used and the test organism. It is a value decision whether a concentration approaching even the LD_1 level is acceptable.

Afew examples of toxicity levels for aquatic organisms are as follows (TL_M, LD_{50}, and LC_{50} all measure the dosage which will kill 50% of the test species.):

Bluegill: 48 hr. TL_M - 375 ppm at 25^0 - using propylene glycol butyl ester.[15]

Largemouth Bass: 48 hr. TL_M - 350 ppm at 25^0 - using propylene glycol butyl ester.[15]

Trout & Bluegill: The U.S. Fish and Wildlife Service determined that these were killed during a 24 hour exposure to 5 mg./l. Number not specified. Material was butyl ester.[16]

Trout: Tests in England showed that the 24 hour LD_{50} for trout or similar fish was .5 parts per million. Ester or formulation not specified.[17]

Crustaceans: 25% loss reported at .1 - .4 mg./l.[16]

Snails: 25% loss reported at 2.4 - 3.3 mg./l.[16]

Flathead minnows: .3 mg./l of the butoxy ethanol ester does not reduce production rate. 1.5 mg./l for 48 hours kill eggs.[18]

The standard application of 2,4-D is 2 pounds per acre of the acid equivalent. Since the molecular weight of the n-butyl ester is higher than pure acid, 2.2 pounds of the n-butyl ester is applied. A direct accidental application of 2.2 pounds per acre on a lake or stream one foot deep results in a theoretical concentration of .8 ppm or .8 mg./l. If the stream is six inches deep the concentration is 1.6 ppm or 1.6 mg./l. This represents the theoretical instantaneous concentration; in stream rapid dilution would occur. Although these concentrations are in the range which damage aquatic organisms, the strength should be diluted in a short period of time. The exact period of time is unknown. The concentrations resulting from drift or runoff are also not known. Thus, aerial application of 2,4-D could damage aquatic organisms, but only future research can assess the actual damage.

If sagebrush spraying is determined to be not significant in itself the decision on each project's significance in regard to aquatic life must be made on a site specific basis.

III

ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The major adverse effect is on wildlife which may depend on the sagebrush and grass ranges to be treated. Deer, elk, antelope, grouse and many other animals now utilize sagebrush stands which existed under natural conditions or have increased on many ranges due to extensive livestock grazing.

Chemical reduction of sagebrush density will benefit livestock and may reduce the numbers of game and non-game animals supported by these sagebrush ranges. This is especially true of those species that depend on big sagebrush heavily during particular seasons.

The state trust lands were not granted to the state for use as game ranges although the Montana Fish and Game Department leases some state trust lands for this use. The trust lands were granted to the state by the Federal Government for the specific purpose of producing income for schools and institutions. State school lands which have a low livestock forage production because of extensive sagebrush cover are not producing the income which would be possible if sagebrush were partially removed by chemical control.

At the same time the legislature has directed the Department to manage the lands under a multiple use concept. Wildlife usage of state lands is a beneficial multiple use. The main problem then that exists is the question of balance between livestock use and wildlife use. A legal determination would be one answer to that question.

Critical wildlife winter use areas, sage grouse strutting grounds, known calving areas and other critical habitat areas which are identified by Montana Fish and Game Department biologists or are known by the State Land Department would not be considered for treatment. Unique natural areas or high value recreational land would also be excluded from treatment.

At this time, there is no way to assess the reduction in wildlife numbers due to treating a specific parcel of land or to assess if there will even be a reduction. Migration to other big sage ranges or increased dependence on other plant species may occur. There are a number of variables which combine to affect these things and make impact determination more difficult: the nearby range may also be sprayed at a later date; it may not have the carrying capacity to support its present population and the migrating population over a long period of time; and many others.

The impact on wildlife goes beyond the simple reduction of sagebrush. 2,4-D will also kill range forbs. These are utilized and sought out by both livestock and wildlife. It is anticipated that forbs will return but the amount, timing and composition cannot be predicted.

Only ranges which will be put under rest rotation or some other type of grazing system would be considered for treatment. This would help make available to some wildlife species increased grass forage on pastures which are in a rest period. Much wildlife habitat would still be effectively destroyed.

IV

ALTERNATIVES TO CHEMICAL CONTROL OF BIG SAGEBRUSH

Rest Rotation Grazing System:

Only ranges which are under a rest rotation grazing system or other rotation grazing system are to be considered for chemical control of big sage. It is possible that over a long period of time that a rest rotation grazing system alone will produce the desired increase in forage production. One of the purposes of the various grazing systems is to improve the condition of range so that a higher stocking rate may eventually be achieved or the present stocking rate maintained. There is the assumption that present stocking rates on some ranges, under a continuous grazing system, cause losses of desirable species of forage and perhaps increases in sagebrush density.

Grazing systems can produce range improvement and economic benefits similar to that achieved by sagebrush treatment, but more time is required. The alternative of grazing systems alone must always remain a viable choice. Capital investment, however, in fences and water development is required to establish a good grazing system. To wait 5 to 10 years to obtain a probable return on the investment is not a decision that most landowners or lessees are willing to make. Chemical treatment of sage produces immediate (2-3 years) return on the investment.

Burning:

Burning is often used as an alternative to chemical treatment. One untested hypothesis in relation to the increase in sage density on some sites is that the increase may be due not only to over-grazing, but due to man's prevention of range fires. If this is true, then burning would represent a more natural method of reducing sagebrush density. Burning presents the possibility of increased erosion and prolonged disappearance of vegetation immediately surrounding the sagebrush plant, but it would be considered an alternative where geographic and ground conditions permit. There is always the danger of uncontrolled fire.

There are experimental individual plant burning methods utilizing high temperatures without actually producing flame. This method eliminates burning of other plant species.

Burning of any type, however, still reduces wildlife habitat in the form of sagebrush.

Other Mechanical Treatments:

Methods such as plowing, railing, chaining, rotary choppers and rolling choppers have all been used in conjunction with reseeding to reduce sagebrush on ranges. These methods would be considered as alternatives when slope conditions are proper and the range is in such a poor condition that spraying alone will not improve the condition.

Do Nothing:

This alternative could only be acceptable if coupled with a dramatic decrease in numbers of livestock to prevent further deterioration of range.

V

RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTAINANCE OF LONG-TERM PRODUCTIVITY

There have been some confusing research results on the long-term benefits of sagebrush control. A Wyoming study showed an eventual increase, within 14 years, in sagebrush density on a treated and grazed range which was greater than on an adjacent untreated and grazed range.[19] On ungrazed ranges, 17 years after spraying, the number of mature and young sage plants was about the same as on adjoining unsprayed ranges. The grazed ranges were not under any type of rotating or resting grazing system, but it is obvious that chemical sage control in this study did not produce a long range beneficial economic effect. The study cannot be used to make firm conclusions for any control on state lands because of the rotational or resting grazing management which would be required on the state lands. If sage control allows implementation of a grazing system, then long-term productivity will be benefited.

It is unknown whether the continued use of chemical herbicides will reduce the long-term productivity of man, his animals and all systems related to the effect of the chemical. The research results discussed in this statement do not indicate such long-term reduction of productivity.

VI

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED

Although sagebrush on treated range may be re-established in the future by seeding or natural succession, it is assumed that chemical control of sage is a long-range reduction of wildlife sagebrush forage and habitat.

The oil and gasoline reserves utilized in the aerial spraying procedure would also be irretrievable.

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